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ABSTRACT

To investigate cross-sectionally and longitudinally the development of children's early verbal behavior, 10 normal first-born Japanese infants from middle-class families were observed monthly and examined from when they were 6 to 24 months of age. Audio- and video-taped language data were obtained in a laboratory playroom setting during 15-minute sessions of free play with the mother present. Neonatal and postnatal neurological examination records were obtained to establish neonatal activity levels. Infants' scores at 6, 12, 18, and 24 months on the MCC Baby Test (a modification of an instrument by Cattell) were obtained to provide developmental data on search behavior. Of particular interest were (1) the relationship between the time of emergence of the first meaningful word and the emergence of two-word utterances, (2) the relationship between cognitive and language variables, (3) the influence of neonatal activity level upon cognitive and language development, and (4) the relationship of maternal verbal functions at 12 months with cognitive and language development up to 24 months. A correlational analysis was made of 39 variables of language and cognitive development, neonatal activity level, and maternal verbal functions at 12 months. Results are discussed in relationship to previous studies and the need for further research is indicated. (Author/RH)

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Early Language Development in the First Two Years

— A Longitudinal Study on 10 Children —

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and
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EARLY LANGUAGE DEVELOPMENT IN THE FIRST TWO YEARS
- A LONGITUDINAL STUDY ON 10 CHILDREN -

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Language development is subject to numerous influencing variables. These variables may be divided into aspects of the child himself and those of his environment. While working with children with delayed language development, we became keenly aware of the need for more information on early language development.

The prerequisites for a child to develop language normally are a sound neurological bases for intact sensory mechanisms, an effective cognitive processing and storage system, and motor effectors for speech production (Lenneberg, 1967; Moerk, 1973; Taguchi, 1970; Travis, 1971).

Two major areas or dimensions of behavior which appear to be intrinsic to the organism are neonatal activity level and perceptual sensitivity (Escalona, 1968). Activity level was reported to remain constant from earliest infancy into adulthood by Fries (1954), but not by other investigators (Escalona & Heider, 1959; Thomas, et al., 1963). Infants with a high activity level tend to elicit more active mother-infant interactions, and in turn, stimulate more vocalization (Mahoney & Seely, 1976), since vocal activities in infant-mother interaction are reciprocal (Jones & Moss, 1971;Matano, 1977) and continue to be so in childhood (Sherrod, 1977; Snow, 1976, 1977).

Perceptual sensitivities and explorative attitudes towards the environment are also considered to be innate to the organism (Escalona, 1968). Infants are capable of differentiating external stimuli at a

quite early stage (Bower, 1974; Uzgiris & Hunt, 1975). There has been an increasing interest among researchers to examine cognitive correlates of language development (Bates, et al., 1979; Corrigan, 1979; Dihoff & Chapman, 1977; Iitaka, et al., 1980).

Now, we will look into environmental variables on normal language development. Many researchers are in agreement with the need for a warm, accepting mother, as main care-taker, giving consistent and adequate daily care, an intellectually stimulating home environment, and varied and appropriate verbal stimulation during the period of language acquisition (Anderson, 1977; Bruner, 1975; Bowerman, 1978; Clark-Stewart, 1973; Cross, 1978; Elardo, et al., 1977; Escalona, 1968; Mahoney & Seely, 1976; Nelson, 1973; Ro, 1976; Watanabe, 1979).

As stated above, there are numerous variables for normal language development. In attempting to integrate this information, advances are now being made in statistically analyzing multiple variables. Thus, it is possible to search for developmental trends among numerous suggested variables in language as well as other aspects of development (Clark-Stewart, 1973; Watanabe, 1979).

This study was aimed at examining cross-sectionally and longitudinally the developmental process of early verbal behavior of children in a laboratory setting. Specifically, the purposes of the present study were to answer the following questions:

1) Is there any relationship between the time of emergence of the first meaningful word and of two-word utterances?
2) How do cognitive variables relate to early language development?
3) What influence does the neonatal activity level play upon early language development?
4) Is there a relationship between maternal verbal functions with language at 12 months or with cognitive development up to 24 months?

METHOD

Subjects

The subjects were 10 normal, first-born Japanese children (8 males, 2 females) from middle-class families. They were selected as neurologically normal from the Kosei Hospital Well Babies Clinic. Each mother, the main-care taker, had at least a high school education. The subjects were taken from a group of 23 infants on whom we had conducted a 3 year cross-sectional as well as longitudinal study.

Observation Period

For this study, the subjects were observed monthly and examined during the period of 6 to 24 months, from December 1976 to August 1978.

Observation Setting

For speech and language observation, each child and his mother played freely in a 20 ft. by 22 ft. play room, equipped with a teddy bear, a pair of boy and girl dolls, a toy truck, a ball, a pair of toy phones, rubber animals with embedded whistles, a small ring with bells, a music shaker and several picture books. After 12 months, several toys and objects were added to encourage symbolic play. They were miniature cars, cooking utensils, a comb, mirror, and towel set, a set of bedding (a pillow, blanket, etc.), a set for cleaning tools, three twigs, a white piece of paper, and some pieces of sponge.

The room was equipped with a remote controlled zoom lens video camera and another video camera, a sound recording system, and a big one-way mirror so that the interactions of mother-child dyads could be observed and simultaneously recorded from the adjoining observation room.

After the fifteen minute play session which was the last of several of a series of tests and observations on the child at each visit, the mother was interviewed by one of our team staff to clarify and to make additional notes on the monthly developmental questionnaire which each mother had completed before coming to our clinic.

Data Analysis

First, verbatim transcripts were made from the magnetic tape recordings. In order to clarify the contextual cues to the child's utterances,

the video tape recordings were examined against the verbal transcription. The inter-observer reliability on the listening task was .82 on the child and .90 on the mother. When there was a difficult decision to make, two observers made the decision together after re-examining the data.

The first meaningful word was defined as "usage of certain sounds to signify an object, person, or event, observed consistently for at least a two month period." Table 1 shows the first meaningful word observed on each subject in this study. An increase of meaningful utterances for a total group is shown in Figure 1. Two-word utterances were classified according to Yoshida's classification (1975) which was developed for Japanese children based on the work of Fillmore (1968) and Schlesinger (1971). Table 2 shows the definition and examples of two-word combinations. The timing of emergence of first two-word utterances observed on each subject is summarized in Table 3. Figure 2 reveals the development of two-word combinations for a total group.

One striking difference in maternal verbal function was noted between mothers who spoke without regard to the on-going activities of her child and those who spoke in accordance with the activities and interests of this child. A distinction in maternal utterances was made between affirmative, initiating utterances disregarding the child's activities and affirmative responses in regard to the child's activities. The affirmative responses are further divided into "active" (those responses which encourage further comment from the child) and "passive" (those responses which accept and answer the child's vocalization). The classification category for maternal utterances is in Table 4. This was used by Tomiyama for 18 mothers (1978). In classifying each utterance, video tape recordings were examined to obtain contextual cues. The inter-observer reliability for this task was .88. For the present study, the analysis of maternal verbal function was made when the children were 12 months.

Aside from the language data, the neonatal and postnatal neurological examination records were obtained from the Well Babies Clinic, Kosei Hospital. Neonatal activity level was classified into three categories

by R. Sano, M.D., as (1) very active, (2) active, (3) somewhat quiet. The judgment was made after examining records of the neonatal period for the first 24 hours and at the first month check-up, taking into account of vocal and motor activities, responsiveness to human and environmental sounds, the amount of milk taken, and other nursing behaviors of each infant.

The results of the MCC Baby Test (Koga, 1967), a modified version of the Measurement of intelligence of infant and young children by Cattell (2nd edition, 1960), were also obtained. Each subject was tested at the Well Babies Clinic, Kosei Hospital every other month. For the present analysis, the scores at 6, 12, 18, and 24 months were used. Developmental data on search behavior through visual representation in these subjects were reported by Shimada, et al. (1979). Each subject was to search for the hidden object (usually his favorite toy) at three hiding places of white boxes. The fixation time for each subject was measured by two trained observers along with video tape recordings. Table 5 shows the definition of these tasks in visual representation and search behavior.

There was 39 variables for the Spearman rank order correlation. Table 6 summarizes the list of variables used for this analysis.

RESULTS

1. Relationship between the time of emergence of the first meaningful word and of two-word utterances

The rank order correlation between the time of emergence of the first meaningful word and that of two-word utterances was .561 which was not significant at the 5 % level (one-tailed test). However, both the frequency and number of types of two-word combinations at 22 and 24 months showed significantly positive correlations with the timing of emergence of the first meaningful word and that of two-word utterances. The observed vocabularly at 24 months also showed statistically positive correlations with above two variables (Table 7).

2. Relationship between cognitive development and language development

As shown in Table 9, the developmental quotient (DQ) at 12 months and the DQ at 24 months showed significantly positive correlation with the number of types of two-word combinations at 24 months and with all language variables in Table 9, respectively.

The established months of Level I of search behavior and the mean score of search behavior at 10 months were significantly correlated with the initial age in months of emergence of two-word utterances.

3. Relationship between neonatal activity level and language development

The neonatal activity level showed a significantly positive correlation with the confirmed month of visual representation. However, no significant correlation was found between neonatal activity level and cognitive as well as language variables (Table 8).

4. Relationship between maternal verbal functions and the subjects' cognitive and language variables

The correlations of maternal verbal functions at 12 months with her child's cognitive variables are seen in Table 10. The percentage of maternal affirmative active responses showed significantly positive correlations with the DQs at 6, 12, and 18 months and with established month of Level I of search behavior. The significant positive correlations were also found between the percentage of maternal affirmative passive responses and the DQ at 6 months as well as confirmed month of visual representation. The significant negative correlations were seen between the percentage of maternal affirmative initiating utterances regarding to child's activities and confirmed month of visual representation. The percentage of maternal affirmative initiating utterances disregarding child's activities also showed significantly negative correlations with the DQ at 6 months, established month of Level I of search behavior and the mean score of search behavior at 10 months.

As shown in Table 11, only two correlations were significant between

maternal verbal functions and her child's language variables. The first was a negative correlation between the percentage of maternal affirmative initiating utterances disregarding child's activities and observed vocabulary at 24 months. The second was a positive correlation of total maternal utterances with observed vocabulary at 24 months.

DISCUSSION

1. Relationship between the time of emergence of the first meaningful word and that of two-word utterances

It is interesting to note that there were significantly positive correlations between the time of emergence of the first meaningful word and the frequency as well as the type of two-word utterances at 24 months. This suggests that there may be some relationship between language variables at earlier stages with those at later stages. This finding supports Nelson (1973) who found that the mean number of utterances produced by 20-month-old children was positively related to their age when they produced 50 words, 20 phrases, and with the rate of acquisition.

However, in our study there was no significantl positive correlation between the time of emergence of the first meaningful word and that of two-word utterances. In other words, a child who acquired the first meaningful word earlier in this study was not necessarily assured of being the top achiever in uttering two-word sentences. Thus, the overall trend of language development in our study is in agreement with the findings of Nelson, but in some respects, it is not. This difference might be due to differences in sample size, ways of data collection, etc., and indicates a need for further study.

2. Relationship between cognitive development and language development

A significantly positive correlation was observed between DQ at 12 months and the number of types of two-word combinations at 24 months. DQ at 24 months showed significantly positive correlations with the

mean score of search behavior at 10 months as well as Established month of Level I of search behavior. DQ at 24 months also correlated significantly with all language variables listed in Table 9.

Early cognitive variables may reflect an active attitude toward the environment, which in turn, results in a high correlation with language variables at 24 months. The reason there was a significant correlation with language variables at 24 months, and not earlier, might be due to the means of data collection. In the present study, laboratory data was used in determining the time of emergence of the first meaningful word and of two-word utterances. For example, no child at 12 months was observed to utter the first meaningful word. Therefore, the data for language analysis represents a comparatively later period than cognitive variables for the same subjects.

The reason why DQ at 24 months show significantly high correlations with language variables at 24 months may be explained by the content of the developmental test. This test consists of many items with language factors at 24 months, thus yielding high correlations.

Correlational studies on cognitition and language do not always yield positive correlations. This may be due to a lack of exact specification on each variable (Corrigan, 1979). However, there are some who report positive correlations between cognitive and language variables (Dihoff & Robin, 1977; Johnston, 1977; Prawat & Jones, 1977). According to Kagan (1971), infants show distinct cognitive growth at about 9 months. It is interesting to observe that those subjects who revealed substantial growth in cognitive tasks at around 10 months also indicated comparatively accelerated language development at later age shown as the emergence of two-word utterances.

3. Relationship between neonatal activity level and language development

As previously stated, neonatal activity level is one of two dimensions of behavior which appear to be intrinsic to the organism and an important variable in development (Escalona, 1968). In the preverbal period, infant crying, vocalization, and other attention-getting

behaviors help to establish and maintain reciprocal interaction between mother and child (Mahoney & Seely, 1976). In our previous longitudinal study of four children, it was noted that the higher the neonatal activity level, the more accelerated the child was in acquiring verbal language (Iitaka, et al., 1979).

The present study revealed a significantly positive correlation with the confirmed month of visual representation and not with other variables. While it seems possible that a child with a high neonatal activity level interacts actively with his environment, the present study does not support the previously stated hypothesis.

4. Relationship between maternal verbal functions and language as well as cognitive variables

The present analysis yielded significantly positive correlations between maternal affirmative, passive responses with DQ at 6 months and the confirmation of visual representation. Likewise, significantly positive correlations were found between affirmative, active responses and DQs at 6, 12, and 18 months as well as the search behavior at Level I. Significantly negative correlations were observed between affirmative, initiating utterances disregarding child's activities at 12 months and observed vocabulary at 24 months. In addition, the DQ at 6 months and establishment and the mean score at 10 months of search behavior showed significantly negative correlations with the above maternal utterances.

Positive correlations between cognitive variables and maternal verbal responses are supported by previous findings (Clark-Stewart, 1973; Escalona, 1968; Ro, 1976; Watanabe, 1979). The importance of maternal responses in accord with the child's activities was also reported by Cross (1975) who found that 55 % of mothers' utterances for linguistically accelerated children referred to the child's previously expressed topics in that they expanded and semantically extended the child's utterances.

Negative correlations between cognitive variables and maternal attitudes disregarding the child have also been reported (Watanabe,

1979). Premature correcting by the mother often inhibits the child in formulating new concepts (Nelson, 1973). The negative correlation between maternal utterances disregarding child's activities with cognitive and language variables in this study also was supported by our clinical observations.

However, Clark-Stewart (1973) reported that it was the mother's stimulating verbal utterances, not mere responses, which showed the strongest influence upon the linguistic competence of the child. Her categorization of maternal verbal functions does not contain a distinction between responses with and without regard to the child's activities. In addition, Clark-Stewart measured the child's linguistic competence by (1) verbal comprehension, (2) expressed vocabulary at 17 to 17 1/2 months reported by mothers, and (3) verbal responses. In our study, only the frequency of the child's vocalizations and maternal verbal functions at 12 months were analyzed. Maternal verbal utterances are subjected to change with children's growth (Sherrod, 1977; Snow, 1976, 1977). Therefore, further analysis is needed to clarify some of the questions hereby raised.

SUMMARY

The purposes of this study were (1) to examine the relationship between the time of emergence of the first meaningful word and that of two-word utterances, (2) to clarify the positive relationship between cognitive and language variables, (3) to examine the influence of the neonatal activity level upon cognitive as well as language development, and (4) to evaluate the relationship of maternal verbal functions at 12 months with cognitive and language development up to 24 months.

The subjects were 10 normal, first-born children from Japanese middle class families where mothers were the main care-takers. Each child was individually examined and observed monthly from 6 to 24 months. Language data was obtained during 15 minutes of free play with the mother present in a playroom. The confirmation of emergence of the first meaningful word and that of two-word utterances was made after

listening to magnetic tape recordings and then examining the video recordings to consider contextual cues.

A correlational analysis was made among variables of language and cognitive development, neonatal activity level, and maternal verbal functions at 12 months. The results are as follows:

(1) There was no significant correlation between the time of emergence of the first meaningful word and that of two-word utterances, but there was a significant correlation between the time of emergence of the first meaningful word and the frequency as well as the number of types of two-word combinations at 24 months.

(2) There was a significantly positive correlation between the DQ at 12 months and the number of types of two-word combinations at 24 months. Significantly positive correlations were also found between DQ at 24 months and the month of emergence of the first meaningful word, that of two-word utterances, frequencies of two-word utterances at 24 months, and the number of types of two-word combinations at 24 months.

(3) A significantly positive correlation was found between neonatal activity level and the confirmed month of visual representation, but not with language variables.

(4) There were significantly positive correlations between maternal affirmative, passive responses with DQ at 6 months as well as the confirmation of visual representation. Likewise, significantly positive correlations of affirmative, active responses with DQs at 6, 12, and 18 months, and with establishment of search behavior were also noted. Significantly negative correlations were found between maternal affirmative, initiating utterances disregarding the child's activities and observed vocabulary at 24 months as well as the DQ at 6 months and the mean score at 10 months of search behavior.

The results were discussed in relation to previous studies and the need for further studies was suggested.

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Table 1 First Meaningful Word observed in Laboratory Setting

Subject No.	Month of Emergence	(Maternal Report)	First Word	Situations
1	14	(9th M.)	"boo, boo"*(car)	naming the toy car
2	16	(6th M.)	"densha" (train)	pointing to the toy train
3	14	(10th M.)	" boo " (car)	while moving the toy car
4	16	(10th M.)	"wan, wan"*(doggie)	naming the picture in a book
5	14	(10th M.)	"boo, boo" (car)	naming the toy car
6	18	(15th M.)	"ma, ma" (mammy)	calling his mother
7	14	(8th M.)	" uhn " (yes)	nodding to his mother's request
8	18	(13th M.)	" uhn " (yes)	in response to his mother's question
9**	18	(6th M.)	"boo, boo" (car)	naming the toy car
10**	16	(12th M.)	" uhn " (yes)	in responding to her mother's question

* babyish expression ** two-female subjects

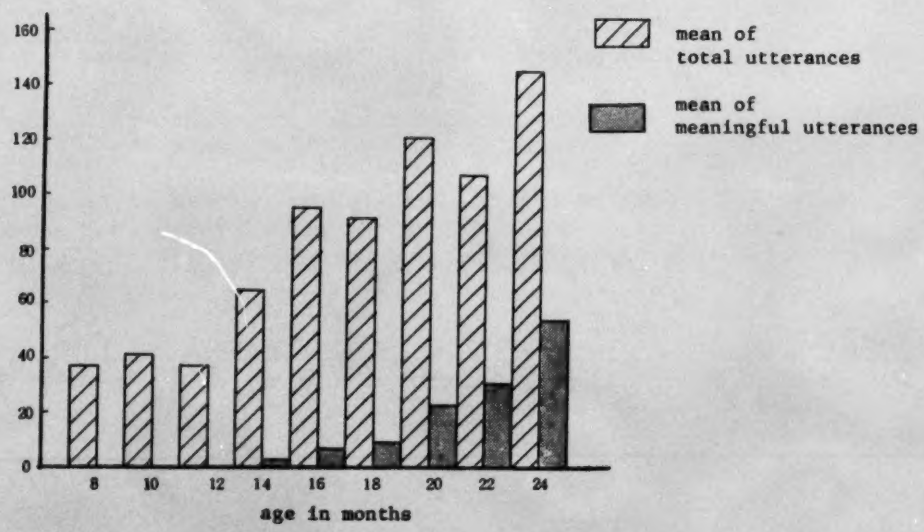

Figure 1 Increase of Meaningful Utterances for a Total Gtoup

Table 2 Definitions of Two-Word* Combinations (Yoshida, 1975)

Combinatorial Structure		Definitions	Examples
Nominative	+ Predicate Verb	Agent, actor + action, state	"Boo, boo nai" (car gone) "Boru atta" (ball appeared)
Accusative	+ Pred. Verb	Action, and its state identified by pred. verb + direct object	"Wan, wan noseru" (put doggie)
Locative	+ Pred. Verb	Location or direction + action	"Boo, boo ni noru" (ride on car) "Koko e iku" (go here)
Instrumental	+ Pred. Verb	Action + instrument or means for that action	"Koppu de nonda" (drank with cup)
Dative	+ Pred. Verb	Animate being to whom action identified by pred. verb is directed + action	"Mama ni ageru" (I'll give to mammy)
Comitative	+ Pred. Verb	Animate being who share the common act identified by pred. verb + action	"Mama to iku" (go with mammy)
Predicate Modifier	+ Pred. Verb	Adverb, adverbial phrase + action	"Sugu oriru" (soon, get off)
Nominative**	+ Pred. Adj.	Animate or inanimate being + its attribute, state identified by adjective, or nominal adjective	"Kore ookii" (this, big !)
Objective	+ Pred. Adj.	Accusative object + adjective	"Juice hoshii" (want juice)
Pred. Mod.	+ Pred. Adj.	Adverb, or adverbial phrase + adjective	"Moh, kurai" (already dark)
Nominative	+ Pred. Noun	" X is Y " combination	"Kore ouma" (this, horse)
Nominative	+ Locative	Agent, actor + location	"Mama ouchi" (mammy, home)
Modifier	+ Noun	Adjective, or noun with post-position + noun	"Kireina ningjo" (pretty doll) "Mama no kutsu" (mammy's shoes)

* Strictly speaking, this is not two-word, but two-phrases since a phrase consists of at least content word and zero or more function words.

** In later analysis, the word "nominative" was changed into "theme word."

Table 3 First Two-Word Utterances observed in Laboratory Setting

Subj. No.	1	2	3	4	5	6	7	8	9	10
Initial Month of Emergence	22	22	24	24	18	22	22	24	24	30

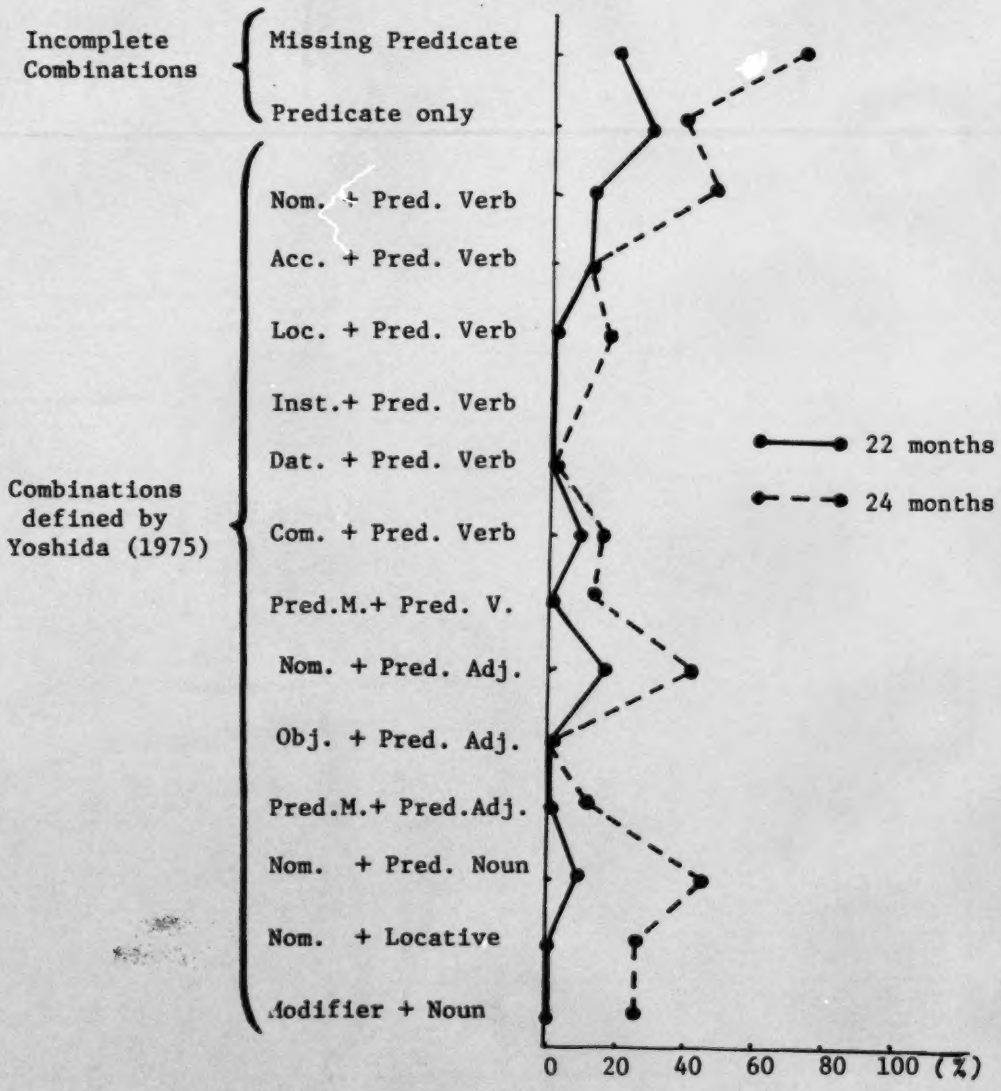

Figure 2 Appearance of Two-Word Combinations for a Total Group

Table 4 Definitions of Maternal Verbal Functions towards 12 month olds*

Category Classification	Definitions
(A) Initiating Verbal Activities and (B) Responding Verbal Activities	
a) Affirmative	
1) Active	
1. question	asking for names, explanation, or intention
2. direction demands	demanding or directing the child's behavior
3. asking	urging the child to do some act
4. attention	calling for the child's attention for danger
5. explanation report	telling or teaching the child about functions or names of toys; explaining their conditions
6. affirmation	affirming the feeling or intention of the child
7. intention	expressing mother's intention for action
8. encouragement	praising or encouraging what the child is doing
9. empathizing	expressing mother's joy or surprise with the child
10. calling	calling the name of the child; talking to him
11. environmental sounds	uttering the sounds of environmental objects, such as those of car, clock, door-bell, etc.
2) Passive	
1. response**	responding with a nod
2. imitation**	repeating what the child utters
b) Negative	
1. prohibiting	making the child stop his activites
2. refusal	refusing to interact with the child
(C) No Response	

* Tomiyama, R. (1978)
** only found in (B) Responding Verbal Activities

Table 5 Definitions of Visual Representation & Search Behavior*

Three Levels of Search Behavior

Level I:	manipulating with fixation only the hiding box and then the hidden toy.
Level II:	manipulating with fixation one or two of the other boxes as well as the hiding box, or manipulating only not-hiding boxes.
Level III:	not manipulating but fixation to the hiding box and/or two other boxes.

Confirmed Month of Visual Representation

The first month when the following A value is significantly higher ($p < .05$ or $p < .01$) than the following B or C value:

$$A = \frac{\text{TFT to the hiding box}}{\text{sum of TFT to each of the three boxes}}$$

$$B = \frac{\text{TFT to one of two other boxes}}{\text{sum of TFT to each of the three boxes}}$$

$$C = \frac{\text{mean of TFTs to two other boxes}}{\text{sum of TFT to each of the three boxes}}$$

TFT: Total Fixation Time

Fixation time was measured immediately after a toy was completely hidden until the toy was seen even partially, or until the end of the 25 sec duration.

Initial Month of Level I

The first month when the search behavior of level I occurred even at a single trial after the confirmed month of visual representation.

Established Month of Level I

The first month when the search behavior of level I successively occurred twice or more starting with the first trial, and then continuing for two or more consecutive months.

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* Shimada, S. et al. (1979), p.15.

Table 6 List of Variables for Correlational Analysis

1. DQ at 6 months
2. DQ at 12 months
3. DQ at 18 months
4. DQ at 24 months
5. Confirmation of visual representation
6. Initial month of Level I of search behavior
7. Established month of Level I of search behavior
8. Mean score of search behavior at 8 months
9. Mean score of search behavior at 10 months
10. Neonatal activity level
11. Initial month of first meaningful word
12. Initial month of first two-word utterances
13. Total vocal utterances at 8 months
14. Total vocal utterances at 10 months
15. Total vocal utterances at 12 months
16. Total verbal utterances at 16 months
17. Total verbal utterances at 22 months
18. Total verbal utterances at 24 months
19. Total imitative utterances at 12 months
20. Total imitative utterances at 16 months
21. Total imitative utterances at 22 months
22. Total imitative utterances at 24 months
23. Total vocabulary at 24 months by questionnaire
24. Total vocabulary observed at 24 months
25. Utterances of two-word combinations at 22 months
26. Number of types of two-word combinations at 22 months
27. Utterances of two-word combinations at 24 months
28. Number of types of two-word combinations at 24 months
29. Percentage of meaningful utterances in total verbal utterances at 16 months
30. The above percentage at 22 months
31. The above percentage at 24 months
32. Percentage of maternal affirmative, initiating utterances in total maternal verbalization
33. Percentage of appearance of maternal negative, initiating utterances
34. Percentage of appearance of maternal affirmative, active responses
35. Percentage of appearance of maternal affirmative, passive responses
36. Percentage of appearance of maternal affirmative, initiating utterances with regard to child's activities
37. Percentage of appearance of maternal negative, initiating utterances regarding to child's activities
38. Percentage of appearance of maternal affirmative, initiating utterances disregarding to child's activities
39. Total maternal utterances

(Note) All maternal variables indicate the ratio to her total utterances observed at 12 months of her child.

Table 7 Rank-Order Correlations between Initial Age in Months of Emergence of First Meaningful Word, Two-Word Utterance, and Other Language Variables (Spearman's Coefficient)

Variables	1	2	3	4	5	6	7
1. Initial age in months of emergence of first meaningful word	1.000						
2. Initial age in months of emergence of two-word utterance	.561	1.000					
3. Two-word utterances at 22 months	.718*	.807**	1.000				
4. Two-word utterances at 24 months	.904**	.754**	.820**	1.000			
5. Number of types of two-word combinations at 22 months	.718*	.839**	.982**	.805**	1.000		
6. Number of types of two-word combinations at 24 months	.884**	.675*	.790**	.981**	.775**	1.000	
7. Observed vocabulary at 24 months	.623*	.734*	.529	.801**	.589*	.789**	1.000

* $p < .05$, ** $p < .01$, one-tailed.

Table 8 Cognitive and Language Variables with Neonatal Activity Level

Correlated Variables	Spearman's Coefficient
1. DQ at 6 months	.155
2. DQ at 12 months	.315
3. DQ at 18 months	.078
4. DQ at 24 months	.081
5. Confirmed month of visual representation	.738*
6. Initial month of Level I of search behavior	.186
7. Established month of Level I of search behavior	.247
8. Mean score of search behavior at 8 months	.145
9. Mean score of search behavior at 10 months	.298
10. Initial age in month of emergence of first meaningful word	.124
11. Initial age in month of emergence of two-word utterance	.069
12. Two-word utterances at 24 months	.075
13. Number of types of two-word combination at 24 months	.181

* $p < .05$, one-tailed.

Table 9 Rank-Order Correlations between Early Cognitive Variables and Language Variables (Spearman's Coefficient)

Variables	1	2	3	4	5	6	7	8	9	10
1. DQ at 6 months	1.000									
2. DQ at 12 months	.638*	1.000								
3. DQ at 18 months	.745*	.718*	1.000							
4. DQ at 24 months	.402	.426	.400	1.000						
5. Established months of Level I of search behavior	.210	.262	.265	.842**	1.000					
6. Mean score of search behavior at 10 months	.480	.206	.114	.640*	.740*	1.000				
7. Initial age in months of emergence of first meaningful word	-.039	.506	.276	.605*	-.042	.060	1.000			
8. Initial age in months of emergence of two-word utterances	.210	.262	.265	.842**	.587*	.636*	.561	1.000		
9. Two-word utterances at 24 months	-.025	.532	.295	.678*	.274	.240	.904**	.754**	1.000	
10. Number of types of two-word combinations at 24 months	.015	.636*	.365	.626*	.281	.192	.884**	.675*	.981**	1.000

* $p < .05$, ** $p < .01$, one-tailed.

Table 10 Correlations of Maternal Verbal Functions at 12 Months with Cognitive Variables (Spearman's Coefficient)

Maternal Verbal Functions	Developmental Quotients				Cognitive Tasks		
	6 Ms.	12 Ms.	18 Ms.	24 Ms.	Confirmed month of visual representation	Established month Level I of search behavior	Mean score of search behavior at 10 Ms.
1. Percentage of negative, initiating utterances	-.019	-.356	-.164	-.370	.141	-.159	-.200
2. Percentage of affirmative, active responses	.602*	.818**	.620*	.304	.146	.756**	.331
3. Percentage of affirmative, passive responses	.602*	.467	.485	.158	.645*	.537	.550
4. Percentage of affirmative, initiating utterances regarding to child's activities	-.274	-.309	-.006	-.006	-.749**	.019	-.113
5. Percentage of affirmative, initiating utterances disregarding child's activities	-.602*	-.394	-.460	-.280	-.388	-.795**	-.700*
6. Total maternal utterances	-.201	.091	-.252	.456	-.166	.433	.475

* $p < .05$, ** $p < .01$, one-tailed.

Table 11 Correlations of Maternal Verbal Functions at 12 Months with Language Variables (Spearman's Coefficient)

Maternal Verbal Functions	Month of emergence of first word	Month of emergence of two-word utterances	Observed Vocabulary at 24 months	Two-word utterances at 24 months	Number of type of two-word combinations at 24 months
1. Percentage of negative, initiating utterances	-.125	-.140	-.330	-.339	-.424
2. Percentage of affirmative, active responses	.156	.367	.370	.404	.489
3. Percentage of affirmative, passive responses	-.117	.079	-.127	-.055	.043
4. Percentage of affirmative, initiating utterances regarding to child's activities	-.234	.210	.152	.007	-.067
5. Percentage of affirmative, initiating utterances disregarding child's activities	.039	-.288	-.700*	-.116	-.153
6. Total maternal utterances	.311	.629	.806**	.508	.471

* $p < .05$, ** $p < .01$, one-tailed.